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UNITED STATES PATENT APPLICATION

FOR

LOWER ANCHOR AND TETHERS FOR CHILDREN (LATCH) DETECTION AND MEASUREMENT DEVICE

INVENTOR:
Edward Burley
Joseph Mazur
Scott B. Gentry
Louis Brown
Keith Bergen

PREPARED BY:

IRELL & MANELLA LLP
840 Newport Center Drive
Suite 400
Newport Beach, California 92660
(949) 760-0991

BACKGROUND OF THE INVENTION

1. Field of the Invention

The subject matter disclosed generally relates to a sensor that can sense when a child safety seat has been coupled to a seat of a vehicle.

2. Background Information

Infants and small children are typically placed within a child safety seat when traveling in a vehicle such as an automobile. The safety seat is strapped onto a seat with the seat belt of the vehicle.

There has been enacted legislation that will require all vehicles to have a ring that extends from between the seat cushions of a seat assembly. Child safety seats will have a corresponding latch that will snap onto the ring and secure the safety seat to the seat assembly. The ring must have a relatively low profile so that occupants of the vehicle can sit on the seat without discomfort when the child safety seat is not in use. The low profile makes it difficult to determine whether the safety seat latch has been properly attached to the ring.

There has been enacted legislation to require automobile manufacturers to disable the passive restraint system for occupants under a predetermined weight. Vehicles that comply with this legislation may have a weight sensor in the seat that senses the weight of the occupant and provides a feedback signal to the restraint system. Unfortunately, the new latch feature of the child safety seat may be tightened to create an improper reading of the occupant's weight. The additional tension force of the latch may increase the force sensed by the weight sensor so that the system mistakenly believes that an infant is an adult and remains enabled.

It would be desirable to provide a system that would indicate when a latch of a child safety seat has been attached to a seat assembly of a vehicle.

BRIEF SUMMARY OF THE INVENTION

A sensor that can sense when a latch of a child safety seat has been coupled to a seat assembly.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a side view showing a child safety seat coupled to a seat assembly of a vehicle;

Figure 2 is a top front perspective view showing a sensor mounted to a seat frame;

Figure 3 is a schematic showing a sensor system;

Figure 4 is a top perspective view showing an embodiment of a sensor;

Figure 5 is top perspective view showing another embodiment of the sensor.

DETAILED DESCRIPTION

Disclosed is a sensor for sensing when a latch of a child safety seat is coupled to a seat assembly of a vehicle. The sensor may include a first housing member that is mounted to a seat frame of the vehicle. The sensor may also include a second housing member that can move relative to the first housing member. A sensor subassembly may sense the relative movement of the second housing member. The latch of the child safety seat can be snapped onto a ring of the second housing member and subsequently tightened to secure the child seat to the vehicle. Coupling the child seat to the ring moves the second housing member relative to the first housing member. This movement is sensed by the sensor which provides an output signal. The output signal can be processed to provide an indication to the vehicle driver that the child seat has been coupled to the seat, and/or disable an airbag and/or disable a seat movement device.

Referring to the drawings more particularly by reference numbers, Figure 1 shows a child safety seat 10 coupled to a seat assembly 12. The seat assembly 12 is

typically part of a vehicle such as an automobile. The child safety seat 10 is typically configured to support an infant or small child, and rest on the seat cushions 14 of the seat 12. The child seat 10 includes a latch (not shown) that is coupled to the seat assembly 12. The tension of the latch may be tightened through strap 16.

As shown in Figure 2, a sensor 20 can be mounted to a seat frame 22 of the seat assembly. The sensor 20 includes a ring 24 that extends from between the seat cushions (not shown). The latch of the child safety seat can be snapped onto the ring to secure the child seat to the seat frame 22.

As shown in Figure 3, the sensor 20 can be coupled to a controller 30 or computer of the vehicle. The sensor 20 can provide an input signal to the controller 30. The controller 30 can then provide an output signal to a display 32. The display 32 provides an indication that the latch of the child safety seat has been properly secured to the seat assembly. The display 32 may provide a visual or audio indication. For example, the display may be a light lamp that is illuminated on the dashboard of the vehicle,

or the indication may be a noise, or the cessation of a noise emitted by the vehicle.

The controller 30 may also disable the air bag 34 adjacent to the child seat 10. The air bag 34 may be disabled when the controller 30 determines that the child latch has been properly secured to the seat assembly. Additionally, movement of the seat assembly may stretch or even break the child seat strap. The controller 30 may also prevent movement of the seat when the latch is secured to the seat assembly. Seat movement may be inhibited by disabling the seat motor, engaging some type of mechanical latch, or other means.

The input signal from the sensor 20 may be a signal that has two levels, one level to indicate that the latch has not been properly attached and another level that the child seat has been properly attached. Alternatively, the input signal may have an amplitude that varies with the latch force sensed by the sensor 20. For example, the voltage of the input signal may vary between 0-5V for a load range of 0-30 lbs. The controller 30 can then determine whether the amplitude exceeds a threshold value

and drive the display 32, accordingly. Although a controller 30 is shown and described, it is to be understood that the sensor 20 may provide the input signal directly to the display 32.

Figure 4 shows an embodiment of a sensor 20. The sensor 20 may include a first housing member 40 and a second housing member 42. The first housing member 40 may include a flange 44 with an opening 46. A fastener (not shown) can pass through the opening 46 to secure the flange 44 and first housing member 40 to a seat assembly (see Fig. 2). Although a flange 44 and opening 46 are shown and described, it is to be understood that the sensor 20 may be attached to the seat assembly by other means.

The second housing member 42 can move relative to the first housing member 40. The second housing member 42 includes the ring 24. The ring 24 can be formed with the second housing member 42 or attached to the housing member 42, for example with a welding process. The first housing member 40 may include stop surfaces 48 that engage flanges 50 of the second housing member 42 to limit the travel of the second member 42. A portion of the second housing

member 42 may reside in a cavity 52 of the first housing member 40 to minimize the profile of the sensor 20.

The sensor 20 further includes a sensor subassembly 60 that senses movement of the second housing member 42. The subassembly 60 may include a magnet 62 and a Hall Effect sensor 64. Located between the magnet 62 and Hall Effect sensor 64 is an armature 66. The armature 66 is mounted to a restraining plate 68 that is attached to the second housing member 42. Movement of the second housing member 42 moves the armature 66 and changes the magnetic field sensed by the Hall Effect sensor 64. The Hall Effect sensor 64 provides an output signal on wires 70 that varies in accordance with movement of the armature 66 and second member 42. Although a Hall Effect sensor is shown and described, it is to be understood that other types of sensors such as force or pressure sensors may be employed.

The sensor 20 may include a biasing spring 72 that biases the second housing member 42 toward the magnet 62 and Hall Effect sensor 64. The spring 72 may be captured by a wall 74 of the first housing member 40 and the restraining plate 68. The spring 72 may be centered about

button 76. The sensor subassembly 60 may be enclosed by a cover 78 that is attached to the first housing member 40 through fastener apertures 80.

In operation, the child seat latch is snapped onto the ring 24. The latch is tightened which causes a force in the direction indicated by the arrow shown in Fig. 4. The force moves the second housing member 42 and armature 66. Movement of the armature 66 is sensed by the Hall Effect sensor 64. The output signal of the Hall Effect sensor 64 varies as a function of the armature movement. The output signal can be processed by the controller (see Fig. 3.) to determine the latch force and whether the child seat latch has been attached to the ring 24 and seat assembly 22.

Figure 5 shows another embodiment of a sensor 20'. Instead of a Hall Effect sensor this sensor 20 includes a switch 100 with a mechanical button 102. The button 102 is in contact with the restraining plate 68. Movement of the second housing member 42 will move the plate 68 away from the button 102. The switch button 102 is internally biased so that the button 102 moves in an outward direction with the plate 68. Movement of the button 102 beyond some limit

will cause the switch 100 to provide an output signal. The output signal may represent that the second housing member 42 has traveled a certain distance, a distance that may indicate a proper attachment of the child seat latch to the ring 24. The proper attachment force can be established by the spring force of the spring 72.

While certain exemplary embodiments have been described and shown in the accompanying drawings, it is to be understood that such embodiments are merely illustrative of and not restrictive on the broad invention, and that this invention not be limited to the specific constructions and arrangements shown and described, since various other modifications may occur to those ordinarily skilled in the art.